

Original Research Article

Functional and Anatomical Outcomes of Endoscopic vs External Dacryocystorhinostomy in Patients with Nasolacrimal Duct Obstruction

Dr. A.K.M. Mamunur Rahman^{1*}, Dr. Kripadhan Chakroborty², Prof. Dr. A. H. M. Enayet Hussain³, Dr. Dewan Fazle Ghani⁴, Dr. Rafia Islam Jui⁵

¹Associate Professor, Department of Ophthalmology, Jahurul Islam Medical College, Kishoreganj, Bangladesh

²Associate Professor, Department of Ophthalmology, Kumuduni Women's Medical College, Mirzapur, Tangail, Bangladesh

³Professor and Head, Department of Pediatric Ophthalmology and Strabismus, National Institute of Ophthalmology & Hospital, Dhaka, Bangladesh

⁴Junior Consultant, Department of Ophthalmology, Ispahani Islamia Eye Institute and Hospital, Dhaka, Bangladesh

⁵Student, Department of Ophthalmology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

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Abstract: Background: Nasolacrimal duct obstruction is a common ophthalmic condition that frequently presents with persistent tearing (epiphora) and episodes of dacryocystitis, significantly affecting patients' quality of life. The purpose of this study was to compare the functional and anatomical outcomes of endoscopic versus external dacryocystorhinostomy in patients with nasolacrimal duct obstruction. **Methods:** This prospective, non-randomized study at the Department of Ophthalmology, National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh, included 72 patients undergoing endoscopic or external dacryocystorhinostomy, followed for six months to assess anatomical and functional outcomes, intraoperative bleeding, and postoperative recovery. Preoperative evaluation used syringing, fluorescein dye, and dacryocystography when needed; data were analyzed with SPSS, with $p < 0.05$ considered significant. **Results:** Seventy-two patients (80 eyes) underwent DCR: 42 patients (50 eyes) EN-DCR, 30 patients (30 eyes) EX-DCR. Bilateral surgery was performed in 19.0% of EN-DCR patients ($p = 0.018$). EN-DCR patients were younger (33.6 ± 10.5 vs 46.0 ± 11.8 years, $p < 0.001$) with similar female predominance (57.1% vs 53.3%, $p = 0.936$) and eye laterality ($p = 1.000$). Anatomical and functional success were comparable (92.0% vs 93.3%). Minimal bleeding was more common in EN-DCR (56.0% vs 20.0%, $p < 0.001$). Hospital stay was shorter (1.3 ± 0.5 vs 2.6 ± 0.8 days, $p < 0.001$) with faster recovery (83.3% vs 60.0%, $p = 0.025$). **Conclusion:** Endoscopic and external DCR are equally effective for NLDO, with endoscopic DCR offering less bleeding and faster recovery.

Keywords: Functional, Anatomical, Dacryocystorhinostomy.

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INTRODUCTION

Nasolacrimal duct obstruction is among the most frequently encountered ophthalmic conditions. Its typical clinical presentation includes persistent tearing (epiphora) and episodes of dacryocystitis [1]. The standard surgical intervention for managing nasolacrimal duct obstruction is dacryocystorhinostomy (DCR). Patients affected by this condition often suffer from ongoing lacrimal drainage issues, repeated infections, and a negative impact on daily activities and overall quality of life, underscoring the necessity for effective surgical treatment.

The traditional external DCR (EX-DCR) involves accessing the lacrimal sac through a skin incision, a technique favored for its high efficacy and relatively low rate of complications. In recent years,

endoscopic endonasal DCR (EN-DCR) has gained popularity by allowing direct visualization of the lacrimal sac through endoscopic guidance. Although Caldwell first described the endonasal route for lacrimal surgery in 1893, its widespread adoption occurred only after the development of modern endoscopic instruments and refined techniques [2]. This endoscopic approach offers the advantage of avoiding a visible facial scar and minimizes disruption of the neurovascular structures along the lacrimal tract. EX-DCR provides benefits such as direct identification of lacrimal sac pathology, no reliance on costly equipment, and the ability to create precise flaps for anastomosis between the lacrimal sac and nasal mucosa. However, it is associated with drawbacks including potential scarring at the incision site and impairment of the lacrimal pump mechanism [3]. EN-DCR, on the other hand, maintains the integrity of

*Corresponding Author: Dr. A.K.M. Mamunur Rahman

Associate Professor, Department of Ophthalmology, Jahurul Islam Medical College, Kishoreganj, Bangladesh

lacrimal pump function, eliminates external scarring, and allows simultaneous treatment of coexisting intranasal pathology [4].

Success rates reported for both external and endoscopic approaches vary widely, ranging from 60% to 99% [5-7], reflecting differences in surgical technique, patient populations, and the lack of uniform outcome measurement [8-12]. While EN-DCR can be performed by either ophthalmologists or otorhinolaryngologists, EX-DCR is generally limited to ophthalmologists [1,10]. Comparative studies that directly assess the two approaches are relatively few, which has perpetuated debate over which technique provides superior functional and anatomical outcomes, particularly regarding intraoperative bleeding, postoperative recovery, and long-term patency.

Minimally invasive techniques have become increasingly prevalent across ophthalmic surgery, and EN-DCR represents a significant advancement in this context, although its success is generally considered slightly lower than that of the traditional external approach, which remains the gold standard [13-15]. The endoscopic procedure is frequently preferred by younger patients seeking to avoid facial scars and by older patients aiming to reduce the risks associated with hypotensive anesthesia. Therefore, a thorough comparison of EN-DCR and EX-DCR is clinically important to inform surgical decision-making, optimize patient outcomes, and guide surgical planning. The purpose of this study is to compare the functional and anatomical outcomes of endoscopic versus external dacryocystorhinostomy in patients with nasolacrimal duct obstruction.

Objective

- To compare the functional and anatomical outcomes of endoscopic versus external dacryocystorhinostomy in patients with nasolacrimal duct obstruction.

METHODOLOGY & MATERIALS

This prospective, non-randomized study was conducted at the Department of Ophthalmology, National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh, from January 2011 to April 2012. A total of 72 patients (80 eyes) who underwent either endoscopic dacryocystorhinostomy (EN-DCR) or external dacryocystorhinostomy (EX-DCR) were included based on predefined inclusion and exclusion criteria. All patients were followed for a minimum of six months, with postoperative evaluations at 1, 3, and 6 months to assess functional and anatomical outcomes, intraoperative bleeding, and postoperative recovery parameters.

Inclusion criteria

RESULTS

- EX-DCR:**
 - Middle-aged patients with acquired primary chronic dacryocystitis
 - Nasolacrimal sac or duct obstruction
 - Mucopurulent reflux
 - Obstruction confirmed on probing and irrigation
- EN-DCR:**
 - Younger patients with acute or chronic dacryocystitis
 - Lacrimal abscess
 - Uncontrolled hypertension
 - Favorable intranasal anatomy
 - Failed external dacryocystorhinostomy

Exclusion criteria

- Acute dacryocystitis
- Lacrimal sac tumors
- Chronic hypertension
- Abnormal bleeding or clotting profiles (prolonged BT, CT, or PT)
- Pediatric patients with chronic dacryocystitis
- Nasal anatomical abnormalities (deviated septum, nasal polyps, or tumors)
- Atrophic rhinitis or paranasal suppuration

Demographic variables included age and sex, while clinical variables comprised laterality of involvement and bilaterality of surgery. Preoperative evaluation involved detailed medical and ocular history, with assessment of the level of nasolacrimal obstruction using lacrimal syringing and fluorescein dye testing (Jones test); suspected canalicular obstruction was further evaluated by dacryocystography. Surgical intervention consisted of either endoscopic or external dacryocystorhinostomy performed under local anesthesia, except in children, uncooperative patients, or acute cases where general anesthesia was required. External dacryocystorhinostomy was performed by ophthalmologists, whereas all endoscopic procedures were conducted by a single otorhinolaryngologist. Anatomical outcome was assessed by postoperative patency on syringing for external procedures and by syringing with endoscopic visualization for endoscopic procedures, while functional outcome was determined by the degree of symptomatic relief of epiphora during follow-up. Intraoperative bleeding was categorized as minimal, moderate, or massive, and postoperative recovery was evaluated based on duration of hospital stay and time to return to normal daily activities. Data were analyzed using SPSS software; continuous variables were expressed as mean \pm standard deviation and categorical variables as frequencies and percentages. Categorical variables were analyzed using Chi-square or Fisher's exact test, and continuous variables using the independent samples t-test. A p value <0.05 was considered statistically significant.

Table 1: Demographic and Surgical Characteristics of the Study Population

Characteristic	EN-DCR Group	EX-DCR Group	p-value
Patients, n	42	30	—
Eyes Operated, n	50	30	—
Bilateral Surgery, n patients (%)	8 (19.0%)	0 (0%)	0.018*
Age, years			
— Mean \pm SD	33.6 \pm 10.5	46.0 \pm 11.8	<0.001*
— Range	14–56	28–75	—
Sex, n patients (%)			0.936
— Male	18 (42.9%)	14 (46.7%)	
— Female	24 (57.1%)	16 (53.3%)	
Sex Ratio (M:F)	01:01.3	01:01.1	—
Laterality, n eyes (%)			1.000
— Right	27 (54.0%)	16 (53.3%)	
— Left	23 (46.0%)	14 (46.7%)	

Table 1 summarizes the demographic and baseline surgical characteristics of the study population. The EN-DCR group included 42 patients with 50 operated eyes, while the EX-DCR group comprised 30 patients with 30 operated eyes. Bilateral surgery was performed in 8 patients (19.0%) in the EN-DCR group and none in the EX-DCR group, which was statistically significant ($p = 0.018$). Patients undergoing EN-DCR were significantly younger, with a mean age of $33.6 \pm$

10.5 years (range: 14–56) compared to 46.0 ± 11.8 years (range: 28–75) in the EX-DCR group ($p < 0.001$). Female predominance was observed in both groups, with 24/42 (57.1%) in the EN-DCR group and 16/30 (53.3%) in the EX-DCR group, while sex distribution and male-to-female ratio did not differ significantly ($p = 0.936$). The laterality of operated eyes was comparable between groups ($p = 1.000$).

Table 2: Anatomical Outcomes at 6-Month Follow-up

Outcome	EN-DCR (n = 50 eyes)	EX-DCR (n = 30 eyes)	p-value
Patent lacrimal system	46 (92.0%)	28 (93.3%)	1.000
Non-patent	4 (8.0%)	2 (6.7%)	

Anatomical outcomes at 6 months are shown for EN-DCR and EX-DCR. A patent lacrimal system was achieved in 46 eyes (92.0%) and 28 eyes (93.3%),

respectively, with non-patency in 4 (8.0%) and 2 (6.7%) eyes. The overall difference between groups was not statistically significant ($p = 1.000$).

Table 3: Functional Outcomes at 6-Month Follow-up

Functional Outcome	EN-DCR (n = 50 eyes)	EX-DCR (n = 30 eyes)	p-value
Complete/Significant Relief	46 (92.0%)	28 (93.3%)	1.000
Persistent Epiphora	4 (8.0%)	2 (6.7%)	

Functional outcomes at 6 months show complete or significant relief of epiphora in 46 eyes (92.0%) in the EN-DCR group and 28 eyes (93.3%) in the EX-DCR group, with persistent epiphora in 4 (8.0%)

and 2 (6.7%) eyes, respectively. There was no statistically significant difference between the two surgical groups ($p = 1.000$).

Table 4: Intraoperative Bleeding Severity and Complications

Complication / Finding	EN-DCR (n = 50)	EX-DCR (n = 30)	p-value
Minimal bleeding	28 (56.0%)	6 (20.0%)	<0.001*
Moderate bleeding	17 (34.0%)	14 (46.7%)	
Massive bleeding	5 (10.0%)	10 (33.3%)	
Major complications	0 (0.0%)	0 (0.0%)	

Intraoperative bleeding was significantly lower in the EN-DCR group, with minimal bleeding in 28 eyes (56.0%) versus 6 eyes (20.0%) in the EX-DCR group ($p < 0.001$). Moderate bleeding occurred in 17 (34.0%) and

14 (46.7%) eyes, and massive bleeding in 5 (10.0%) and 10 (33.3%) eyes, respectively. No major complications were observed in either group.

Table 5: Postoperative Recovery Parameters

Parameter	EN-DCR (n = 42 patients)	EX-DCR (n = 30 patients)	p-value
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Hospital Stay (days)			<0.001*
– Mean \pm SD	1.3 \pm 0.5	2.6 \pm 0.8	
Early Return to Normal Activity	35 (83.3%)	18 (60.0%)	0.025*

Postoperative recovery was faster in the EN-DCR group compared to the EX-DCR group. The mean hospital stay was significantly shorter for EN-DCR patients (1.3 \pm 0.5 days) than for EX-DCR patients (2.6 \pm 0.8 days, $p < 0.001$). Similarly, a higher proportion of EN-DCR patients (35/42, 83.3%) returned to normal daily activities early, compared to 18/30 (60.0%) in the EX-DCR group ($p = 0.025$).

DISCUSSION

Nasolacrimal duct obstruction is a prevalent ophthalmic condition that can cause persistent tearing, recurrent dacryocystitis, and significant impairment in patients' quality of life if not effectively treated. Dacryocystorhinostomy (DCR), whether performed via external or endoscopic approaches, remains the standard surgical intervention to restore lacrimal drainage. The findings of this study demonstrate that both endoscopic and external DCR achieve high rates of anatomical patency and functional relief of epiphora, while the endoscopic approach is associated with reduced intraoperative bleeding and faster postoperative recovery. These results highlight the clinical relevance of selecting an appropriate surgical approach based on patient characteristics, procedural risks, and recovery expectations to optimize outcomes in individuals with nasolacrimal duct obstruction.

The demographic and surgical characteristics of our study population show that the EN-DCR group included 42 patients with 50 operated eyes, whereas the EX-DCR group consisted of 30 patients with 30 operated eyes. Bilateral surgery was performed in 8 patients (19.0%) in the EN-DCR group, whereas none in the EX-DCR group underwent bilateral procedures, a statistically significant difference ($p = 0.018$). Patients in the EN-DCR group were significantly younger, with a mean age of 33.6 \pm 10.5 years compared to 46.0 \pm 11.8 years in the EX-DCR group ($p < 0.001$). Female predominance was observed in both groups (57.1% in EN-DCR vs. 53.3% in EX-DCR), with male-to-female ratios of 1:1.3 and 1:1.1, respectively, showing no significant difference in sex distribution ($p = 0.936$). Laterality of operated eyes was comparable between groups ($p = 1.000$). These findings align with previously published studies, which consistently report female predominance and a broad adult age range among patients undergoing DCR. Yigit *et al.*[16] observed more females than males among 103 patients (55 EX-DCR, 48 EN-DCR) with mean ages around middle adulthood, reflecting a demographic pattern similar to ours. Karim *et al.*[17], in a cohort of 205 patients, reported 62.4% female predominance and higher mean ages, highlighting that NLDO commonly affects older women. Likewise, Ben *et al.*[9] found a predominance of female

patients with a wide age range in 143 patients, supporting the notion that DCR is performed across a wide adult age spectrum with comparable sex distributions.

Anatomical patency was achieved in 92.0% of eyes undergoing EN-DCR and 93.3% of eyes undergoing EX-DCR, with non-patency in 8.0% and 6.7% of eyes, respectively, showing no statistically significant difference ($p = 1.000$). This is consistent with Karim *et al.*[17], who reported similar high success rates for external (82.4%) and endoscopic endonasal DCR (81.6%) in patients with acquired NLDO ($p \approx 0.895$), indicating that both techniques are highly effective for restoring lacrimal drainage.

Functional outcomes were similarly high, with complete or significant relief of epiphora observed in 92.0% of EN-DCR eyes and 93.3% of EX-DCR eyes, and persistent symptoms in 8.0% and 6.7% of eyes, respectively ($p = 1.000$). These results are comparable to earlier reports demonstrating equivalent functional success. Cokkeser *et al.*[18], in a retrospective study of 115 patients (130 eyes) treated from 1994–1998, reported resolution of tearing in 88.2% of endoscopic DCR eyes and 89.8% of external DCR eyes, while Ben *et al.*[9] found similarly high rates of symptom relief in 143 patients (176 surgeries) treated from 1999–2004. Overall, these findings suggest that both EN-DCR and EX-DCR reliably relieve epiphora, and the choice of procedure may depend more on anatomical considerations and surgeon preference than on differences in functional outcomes.

Intraoperative bleeding was significantly lower in the EN-DCR group, with minimal bleeding observed in 56.0% of endoscopic cases compared to 20.0% of external cases, while massive bleeding was more frequent in the EX-DCR group (33.3% vs 10.0%). These findings are in line with Khan *et al.*[19], who reported bleeding in 20% of endoscopic cases and 13.3% of external cases, with overall low complication rates managed conservatively. Similarly, Saha *et al.*[20] observed higher rates of intraoperative hemorrhage in external DCR, whereas endoscopic procedures exhibited minimal bleeding, reinforcing the advantage of endoscopic DCR in reducing intraoperative bleeding risk. No major complications were observed in either group, consistent with prior literature.

Postoperative recovery was faster following EN-DCR, with a shorter mean hospital stay (1.3 \pm 0.5 days vs. 2.6 \pm 0.8 days, $p < 0.001$) and a higher proportion of patients returning early to normal activities (83.3% vs. 60.0%, $p = 0.025$). These results correspond to observations by Karim *et al.*[17], who noted that endoscopic approaches avoid external incisions and

better preserve lacrimal pump function, contributing to fewer postoperative issues and quicker rehabilitation. Herzallah *et al.*[21] similarly emphasized that endonasal/endoscopic DCR reduces soft tissue disruption relative to external techniques, promoting faster recovery and improved early postoperative comfort, supporting the clinical advantage of EN-DCR in postoperative recovery.

Limitations of the study

The study had a few limitations:

- The study was hospital-based, which may have introduced selection bias.
- The study period was relatively short.
- Younger patients tended to choose endoscopic DCR, resulting in age differences between groups that could influence outcomes.
- Different surgeons performed the endoscopic and external DCR procedures, which may have affected surgical results.

CONCLUSION

Endoscopic and external dacryocystorhinostomy are commonly performed procedures for treating nasolacrimal duct obstruction, aiming to restore lacrimal drainage and relieve epiphora. Both approaches demonstrated high anatomical and functional success, while endoscopic DCR was associated with reduced intraoperative bleeding, shorter hospital stay, and faster return to normal activities, suggesting comparable efficacy with improved perioperative safety and recovery.

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